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THE REVIEW

DEVOTED TO THE INTERESTS OF THE AMERICAN SOCIETY FOR METALS

Volume X | FEBRUARY, 1937 | No. 2

First Chicago Meeting Acted In Short Skit

Old Timers Are Honored; Bain Speaks at President's Night

By D. R. Howerton

Chicago Chapter—The Program Committee, in its very capable manner, presented a most delightful and instructive meeting on Jan. 14.

The snowstorm which began early in the afternoon apparently had no effect on the crowd present; 410 members and guests attended the dinner and well over 500 were at the meeting proper.

This meeting, designated as National President's and Old Timers' Night, was opened by Chapter Chairman J. F. Calef, who introduced R. L. Kenyon of the Board of Trustees. Mr. Kenyon announced the winners of the honorary student awards and introduced these new junior members.

National Secretary W. H. Eisenman, in his own inimitable style, gave a résumé of the Chicago Chapter's growth in the past few years.

In honor of the old timers, a short skit was presented depicting the first meeting held by the Chapter founders, A. G. Henry and T. E. Barker.

Past-President R. S. Archer, as technical chairman of the meeting, introduced the National President and speaker of the evening, Dr. E. C. Bain, assistant to vice-president, United States Steel Corp. The subject of Dr. Bain's address was "Apparent Anomalies in the Hardening of Steel," in which the concepts of hardenability originally set forth in his Campbell Lecture were reviewed.

Following this most interesting lecture, a question session was engaged in by many present. It was well after 11 o'clock before the meeting was broken up; however, with the interest shown by all, it could have lasted for hours longer.

There was only one way to describe the evening, and only the words of the National Secretary could do it: "'Twas supermastodonically terrific."

Boston Meeting Is Devoted To Arc Welding Problems

By Howard E. Handy

Boston Chapter—The December meeting of the Boston Chapter was held at the Massachusetts Institute of Technology and was devoted to welding problems. Guest speaker was W. L. Warner, metallurgical engineer, Watertown Arsenal.

Mr. Warner's work in recent years has been principally connected with the fabrication of structural parts by arc welding, and he described in detail his actual welding experience with carbon and low alloy steels.

Prior to the technical session, dinner was served to about 50 members of the Chapter in the dining room of Walker Memorial, following which Chairman J. P. Walsted described briefly the Boston Chapter Educational Course which started at M.I.T. on Jan. 6, continuing weekly for 15 weeks.

Compliments

To **Jones & Laughlin Steel Corp.** on having obtained the services of J. M. **"Mike" Watson**, past president of the American Society for Metals, as a valuable assistant in its Detroit Office.

To **Fred Reiter**, industrial engineer of the Dayton Power and Light Co., who is now completing ten years as secretary of the Dayton Chapter.

To **United States Steel Corp.** for the splendid impression being made by **Dr. Eddie Bain**, president of the American Society for Metals, in the presentation of his paper on "The Anomalies of Heat Treatment" during his official visit to many chapters.

To **Climax Molybdenum Co.** for having as an important cog in its organization **Carl M. Loeb, Jr.**, who was the greatest basketball player ever to play on a Princeton team, and who also assisted in coaching the M.I.T. basketball team during his enrollment at the latter institution.

To *Metal Progress* **Editor Ernie Thum**, whose son Bob will run and win the quarter and half-mile distances for the Princeton track team during the present spring meets, and whose older son Charles, a graduate of Princeton two years ago, now holds a three-year travel fellowship in architecture at the Beaux Arts in Paris.

To **Harry Harris**, president of General Alloys Co., on the splendid aerial photographs taken while driving his own plane and manipulating his own camera.

To **Louis E. Murphy**, who retires as chairman of the board of E. F. Houghton & Co. after 48 years of continuous service, but will remain a director of the company.

To **Hyman Bornstein**, chief metallurgist, Deere & Co., past chairman Tri-City Chapter, past director A.S.M., on his selection by the nominating committee to be president of the American Foundrymen's Association.

Copper Brittleness Discussion Gives Results of 25-Year Study

T. S. Fuller Also Tells About Unusual Fractures and the New Copper-Beryllium Alloys of High Strength

By Merrill A. Scheil

Milwaukee Chapter members spent an enlightening and enjoyable evening on Dec. 17.

Coffee talker was one of the national figures in collegiate football, Coach Frank Murray of Marquette University, whose talk emphasized the changes that are taking place in modern football. Coach Murray uses over 100 different formations and plays.

T. S. Fuller

The regular meeting was devoted to non-ferrous metallurgy with Truman S. Fuller of the Research Laboratory, General Electric Co., Schenectady, as guest speaker. Mr. Fuller's talk was divided into three parts.

"The Brittleness of Tough Pitch Copper in Reducing Atmospheres," the title of the first part, is a subject which has been studied by Mr. Fuller for over 25 years.

Some examples of copper embrittlement are acetylene brazed joints and soldered ends of enameled coated wire, the vapors from the enamel causing embrittlement. The physical difference between oxygen-free copper and tough pitch copper lies mainly in the ability of the oxygen-free copper to retain toughness in reducing atmospheres.

Brittle Fractures in Copper

The second part of the talk concerned unusual fractures observed in copper. During some elevated temperature tests under sustained loads it was found that a sample of tough pitch copper broke in a short time with a brittle type of fracture at 165°C. This was characterized by an intergranular fracture.

At a temperature of 140°C., other conditions being the same, specimens of the same copper failed with intragranular fractures. The equicohesive temperature of this copper, therefore, lies somewhere between 140°C. and 165°C.

Specimens of copper carrying 8 oz. and 25 oz. of silver per ton under similar conditions showed intragranular fractures at 275°C. and indications of intergranular failures at 300°C.

Finally, the new copper-beryllium alloys were discussed. The alloy with 2.6% Co, 0.4% Be, and 97% Cu forms the compound CoBe. The alloy with 0.4% Cr, 0.1% Be, and 99.5% Cu forms the compound CrBe. Both of these alloys are susceptible to precipitation hardening and show exceptionally high strength and conductivity.

Be Alloys for Springs

The Cu-Co-Be alloy has high strength at elevated temperatures and is satisfactory for springs. Other applications are soldering tips for use up to 500°C. Tests have shown these to have ten times the life of ordinary copper. The hardness and conductivity of this alloy make it useful as a resistance welding electrode for stainless steel and for current-carrying bushings.

The Cu-Cr-Be alloy develops its best properties after a high temperature quench and draw followed by cold swaging and a precipitation treatment. One of the remarkable properties of this alloy is the high proportional limit and conductivity. The principal use at present is for resistance welding electrodes for carbon steel.

Dr. S. L. Hoyt, associated for many years with the speaker, made the introduction and led the lively discussion.

Krivobok Is Speaker

Discussion Period Clears up Many Problems of Listeners

By B. F. Anthony

Mahoning Valley Chapter—The January meeting was held in the Picadilly Room of the Tod Hotel. A dinner, attended by 50 members and guests, preceded the evening's address by Vsevolod N. Krivobok. Fifty additional listeners gathered for the talk.

The subject, quite timely, was "Recent Developments in Stainless Steels." The speaker's entertaining mannerisms and clear and logical presentation commanded continuous interest, while the discussion period cleared up problems of the individual questioner.

Chairman Goss presided at the short business session following. He thanked the key men selected to contact the membership for this meeting for their excellent cooperation.

Membership Committee Chairman Kent again urged all to be active in obtaining new members.

Reservation Card Brings Boneless Bird —Neglectful Gnaw in Shamed Disgrace

By L. E. Raymond

New Haven Chapter—A careful check was made of the dinner reservations for the January meeting and the proprietor of the Seven Gables Inn decided to give the members a special treat in the form of roast stuffed boneless chicken, a dish the male population of the country has been calling for, so that chicken of broiler size can be eaten in public with knife and fork and ease of mind.

Receiving only 54 reservations by noon, the management of the Inn prepared chicken for 70 customers.

Notwithstanding the slush, sleet and storm of the day, however, 83 members arrived. Nothing was left to do but split and broil another 13 portions of chicken, and some of those who had not made reservations were ignominiously forced to gnaw the chicken from the bone as they would at home.

Following the dinner, Technical Chairman J. D. Tierney of Storts Welding Co., Meriden, introduced Dr. J. C. Hodge, chief metallurgist of Babcock and Wilcox Co., who spoke on welding and weld testing.

So much has been written on Dr. Hodge's ability to present his subject that any further attempt to add to what has been written would be like trying to gild the proverbial lily. Needless to say, in Dr. Hodge's 1½-hr. presentation of his subject, there was no evidence of uneasiness on the part of the gathering.

THE REVIEW

Published monthly by the
American Society for Metals
7016 Euclid Ave., Cleveland, O.

E. C. BAIN, *President*
G. B. WATERHOUSE, *Vice-President*
W. H. EISENMAN, *Secretary*
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Subscriptions fifty cents a year; five cents a copy. Entered as Second Class Matter, July 26, 1930, at the Post Office at Cleveland, Ohio, under the Act of March 3, 1879.

RAY T. BAYLESS.....*Editor*
M. R. HYSLOP.....*Managing Editor*

Cleveland, O., Feb. 1937
Volume X **No. 2**

DO YOU KNOW THAT

THAT . . . the basic wage scale of the steel industry is now 19% above the 1929 level, that 50,000 more employees are at work than at that date, but that steel output is still about 30,000 tons less than in 1929?

* * *

THAT . . . 30 million pounds of steel were used in the manufacture of bicycles in 1936—an all-time high for this industry? And the Gay Nineties supposed to be the last word in cycling!

* * *

THAT . . . the first successful iron enterprise in America was a furnace established in 1645 at Saugus, Mass.? Its capacity was the stupendous total of 400 tons per year!

* * *

THAT . . . nearly half of the world's production of tin is consumed in the United States and that Americans consume about 27 lb. of tin plate per capita per year—50% more than the inhabitants of any other country? More power to the can opener!

* * *

THAT . . . 80% of the weight of the average automobile is steel although not more than $75 of the purchase price is represented by the cost of the steel?

* * *

THAT . . . steel is the least expensive of all the metals, and that the cost per pound is even less than for several kinds of lumber?

* * *

THAT . . . wood is used in steel manufacture? In 1936 20,000 saplings were consumed for "poling" or stirring open-hearth and bessemer steel.

* * *

THAT . . . 900 million pounds of barbed wire and woven wire fencing were produced in 1936—enough to supply each of the 6,800,000 farms in the United States with 1000 ft. each? What chance do the poor cows have to roam?

* * *

THAT . . . more than 290 million dollars will be spent by the steel industry in 1937 for new construction and equipment?

* * *

THAT . . . the United States Steel Corp. alone delivered 1,148,918 tons of finished steel during the month of January?

Palmer Asks and Answers Questions About Tool Steel Progress Since 1929

Design, Tool Making, Material and Heat Treatment Are All Factors in Obtaining Better Steels

By Kurt Siems

Cincinnati Chapter—The Cincinnati Section of the American Society of Mechanical Engineers joined the local Chapter for the meeting on Dec. 10.

Coffee talker was Mr. Anderson, district manager of the American Airlines, who presented data concerning aeronautical problems and showed how the commercial air lines, with the help of the Bureau of Aeronautics at Washington, are solving them.

"What has happened to tool steel since 1929?" was the question then asked and answered in the address of the evening by Frank R. Palmer, assistant to the president, Carpenter Steel Co., Reading, Pa.

The four requisites to obtain better tools are correct design, accurate tool making, the right tool steel, and the proper heat treatment.

The first two are problems for the engineer and tool maker, but the last two depend upon the manufacturer, who should be responsible for developing the most suitable materials and acquainting users with treating instructions.

Prior to 1928 the crop end inspection was the only universal method of finding defects in steel. This test depended entirely upon the human element.

If a tool cracked in hardening or broke in service, the general procedure was to boil it in hot muriatic acid. This would open up any tiny defects too small to be seen with the naked eye, but still large enough to cause failure in the finished tool.

The thought then came that if this acid test could be made after breakage, why not do so beforehand, and the first 100% acid tested steel placed in warehouses was delivered in 1930.

Personality of steel was referred to by the speaker as the "timbre test." It is that property that controls the depth of penetration and size of grain.

By using the timbre test it is possible to obtain duplicate bars of steel of the same analysis. This was an impossibility prior to 1930 when six samples of steel of an identical analysis might have six different grain structures and case depth.

Four reasons were given in answer to the question, "Why don't straight carbon and tool steel tools always work satisfactorily?" Wear resistance may not be high enough for certain applications, greater toughness might be needed, greater accuracy and safety might be required in other instances, or red hardness might be lacking.

This led to a discussion of an ingenious nine-diamond diagram developed as a guide to approximate selection of the proper steel by the designer or tool maker.

Course Opened Jan. 20 By North West Chapter

By E. V. Peterson

An educational course of six lectures was opened by the North West Chapter on Jan. 20.

These meetings are to be held at different plants in the Twin Cities, except the last one, which will be in the Experimental Engineering Bldg. at the University.

The complete program is as follows:

Jan. 20—Heat Treatment of Tool Steel" by W. I. Sweet of the Twin City Steel Treating Co., Minneapolis.

Jan. 27—"Oxy-Acetylene Welding" by W. B. Browning, service engineer, The Linde Air Products Co., Chicago.

Feb. 3—"Electric Welding." Speaker to be announced.

Feb. 10—"Brasses and Bronzes" by J. W. Bryant, foundry manager, Northern Foundry Co., Minneapolis.

Feb. 17—"Cast Iron" by H. L. Campbell, metallurgical engineer, American Hoist & Derrick Co., St. Paul.

Feb. 23—"Testing Ferrous and Non-Ferrous Metals" by Dr. George C. Priester, professor of materials of engineering, University of Minnesota.

Notice to Juniors

A new department will be inaugurated in the March issue of THE REVIEW *devoted to news and features of interest to junior members. Let us know about your achievements, large and small, what is happening in your school, what part you take in chapter activities, what your new job is, or any other item of interest to junior members.*

A.S.M. Home Office Reflects Expansion In Society Activities

The extremely rapid expansion of the American Society for Metals in recent months has necessitated a corresponding expansion of activities in the National Office, according to W. H. Eisenman, secretary of the Society.

With new memberships coming in at the rate of two to three hundred a month, it has been necessary to rent additional office space in the building which the Society occupies at 7016 Euclid Ave., Cleveland, in order to accommodate the records of a total membership which is now over 9,000.

Other activities have been broadened in like manner.

Metal Progress, the monthly magazine of the Society, has been increased in size until it now contains well over 100 pages.

In line with the expansion of chapter activities and the opening of new chapters, THE REVIEW is now being published on a monthly basis instead of bi-monthly.

Demand for books published by the Society has risen to the point where the entire time of one person is required to take care of the orders.

The various chapters of the Society throughout the country are also contributing to this policy of expansion and diversification by varying and increasing their activities to include educational courses, discussion and conference group meetings, plant inspection trips, and the best available speakers and subjects for their monthly meetings.

Gleanings . . .

. . . from the chapters

Sold Out

Who ever heard of an A.S.M. chapter turning members away from the fold! But that's just what is going to happen up in Chicago now that they've reached their 900 limit.

It seems the Executive Committee just got tough and said "900 is the most we can handle properly," and so that's that. Of course, there will be resignations, which will be rapidly filled by names on the waiting list.

Incidentally, the total Society membership is now 9,079.

Again, Juniors

Last month's REVIEW told about two new junior groups being formed. The idea seems to have appealed to some of the boys at Missouri School of Mines, so watch the March issue for news of another group of up-and-coming juniors.

Cincinnati Undampened

Undaunted by the fact that flood conditions prevented the issuing of the regular printed meeting notice, Cincinnati came forth with a closely mimeographed sheet containing all the necessary information concerning the February meeting and exuding their traditional hospitality.

Again, Pigs

Repercussions from Bill Eisenman's famous sow story are still reaching us. It seems that some of the industrialized minds from South Bend don't know what a sow is. The words "she hog" were found inscribed on the back of one of the seats in the auditorium following Officers' Night, Jan. 15.

Versatile

Marc Grossmann, famed member of the Chicago Chapter, doesn't let his preoccupation with technical research and heat treatment get the best of him. Witness his artistic and musical talent as evidenced by the little ditty on the opposite page.

Going Strong

Chapter educational courses are still going strong. North West Chapter opened a new one on Jan. 20, and Boston reports an enrollment of 200—not bad for a membership of 316.

As for Philadelphia's course on how metals behave in service—well, you'll hear more about that later.

Big Things in Store

Keeping up with 9000 members and increasingly active chapters keeps the National Office humping these days. THE REVIEW is also humping itself now that it's a monthly paper, and we hope you'll like some of our new features.

But we still have a surprise in store—wait until you see our new "Junior Page" that will make its debut in the March issue!

The Question Box

Can you answer these ten questions? If not, your Handbook can. Refer to pages noted, Metals Handbook, 1936 Edition.

1. What is the fusing point of pyrometric cone No. 23? See page 9.
2. What is the linear coefficient of thermal expansion of iron? See page 15.
3. What is the heat content of iron? See page 20.
4. What size, shape, and type file is suitable for the file hardness test? See page 38.
5. How do gamma rays and X-rays compare for testing? See page 76.
6. What important factor must be considered in designing when the parts are to be subsequently hardened? See page 96.
7. What are the pressure welding and fusion welding processes? See pages 103 and 105.
8. What is the difference between "flame cutting" of metal and "flame machining"? See page 128.
9. What factors must be considered in the determination of correct furnace sizes? See page 151.
10. What is the difference between carbonizing and carburizing? See page 212.

Hardening of Steel Subject Of F. B. Foley

Explains That Microscope and Thermocouple are Real Basis of Heat Treating

By Louie W. Mosley

Los Angeles Chapter on Jan. 14 had the pleasure of hearing a former chairman of the Philadelphia Chapter, F. B. Foley, speak on the subject of "The Hardening of Steel."

Mr. Foley, who has for many years headed the Research Department of the Midvale Co., proved himself an authority on both the theoretical and practical aspects of his subject.

He spoke first of the various methods of hardening steel other than by heat treatment, but explained that the microscope and the thermocouple have been the basis for real advancement in heat treating and metallurgy in general.

Hardening Depends on Carbon

Illustrating the effect of carbon content on susceptibility to heat treatment, he stated that practically pure iron develops only slightly greater hardness and tensile strength upon being heat treated, whereas the higher carbon steels undergo appreciable physical changes. Some of these chemical and physical transformations, which occur in freshly hardened steel even after heat treatment has been completed, have been carefully measured and determined in the laboratory.

Mr. Foley mentioned the air-hardening steels, in which the addition of chromium produces greater hardening through air quenching alone than can be obtained in unalloyed steels even with the application of actual heat treatment.

Precipitation Hardening of Steel

He mentioned the method of hardening by precipitating the nickel-aluminum compound in steels containing approximately 5% nickel and 3% aluminum, and explained in some detail the methods employed to obtain varying degrees of depth hardening.

In general, fine grain and shallow hardening are associated with normal steels; coarse grain and deep hardening with abnormal steels. Abnormal steel, however, can be transformed into normal steel by excluding oxygen during carburizing.

Speaking of the multiplicity of names applied to the grain structure of steel, Mr. Foley advanced the statement that troostite and sorbite are extremely fine forms of pearlite.

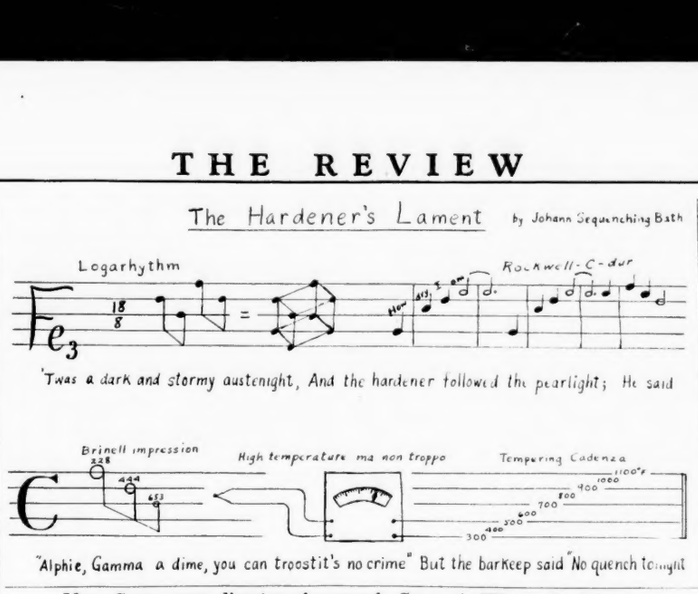
Carbide Solubility Varies

Solubility of different carbides in steel varies greatly; some carbides are so slightly soluble that steels containing them are very difficult to harden.

Alumina-ferrite in steel has a tendency to retard the migration of carbon through grain boundaries or envelopes of ferrite. Only a very active carburizer can break through this envelope and transform the grain structure within.

In the discussion that followed, the question arose as to what would constitute a positive identification of abnormal steel, particularly under the microscope. In answer, Mr. Foley stated that the pearlite in an abnormal steel is characterized by a "peggy" appearance.

Referring to the quenching of steels, it was stated that the 4 to 6% chromium steel, when quenched from 1400° F., produces excellent impact values.


The Hardener's Lament
by Johann Sequenching Bath
Logarhythm
Rockwell-C-dur
'Twas a dark and stormy austenight, And the hardener followed the pearlight; He said
Brinell impression
High temperature ma non troppo
Tempering Cadenza
"Alphie, Gamma a dime, you can troostit's no crime" But the barKeep said "No quench tonight

Marc Grossmann, director of research, Carnegie-Illinois Steel Corp., contributed this little lyric to the celebration of Old Timer's Night by the Chicago Chapter on Jan. 14. (See report on page 1.)

Metals Handbook Is Utilized as Text in Metallurgy Classes

The Metals Handbook, the third edition of which was published by the American Society for Metals last fall, is finding increased use as a textbook in university metallurgical courses.

Sophomore metallurgists at Lehigh University are using the book in their first laboratory course which teaches the use of laboratory equipment. The men study hardness, testing, pyrometry, ingot heating and furnace efficiency, polishing and etching, microscopic examination, photomicrography and spark testing. The Handbook has been chosen because of its up-to-date and practical information on these subjects.

The students also find it valuable as a reference book in advanced work.

Men majoring in metallurgy at University of Cincinnati are expected to purchase the book for use as a reference and as part of their library.

Specific reading assignments are also made to such sections as those covering the constitution of ferrous alloys, properties of iron and iron alloys, heat treatment and surface treatments.

The Handbook, which contains 1400 pages, sells to non-members of the Society for $10, but is available to students using it as a text for a very nominal charge. Many of these students join the Society as junior members and thus may purchase the book for only $2.50, as well as benefit from the other publications and services of the Society.

Diffusion and European Anecdotes on Program

By Hugh E. Brown

Cleveland Chapter — A very fine coffee talk by Dr. Harry A. Schwartz, director of research, National Malleable & Steel Castings Co., Cleveland, at the meeting on Feb. 1, featured his experiences on a recent trip to Europe.

Although his time was limited, Dr. Schwartz gave the members a good idea of what is going on in Russia these days. There is no question but what he will soon be called on for a longer talk.

The technical part of the program was presided over by Dr. Herbert M. Boylston, of Case School of Applied Science. He introduced Dr. Robert F. Mehl, head of the Department of Metallurgy, Carnegie Institute of Technology, who gave one of his usual fine talks. The subject was "Diffusion in Alloys."

The material covered was a nice mixture of theory and practice, and while some of it delved quite deeply into the theoretical nature of diffusion and diffusion rate, nevertheless the subject was so clearly handled that all were intensely interested.

Chicago Hits 900 Limit

Membership in the Chicago Chapter of the American Society for Metals has reached the 900 mark, it was shown in a check-up by the Executive Committee on Feb. 8.

According to action previously taken by the Executive Committee, this figure has been set as a limit for the number of members in the Chapter. No new memberships will therefore be granted in this Chapter except as present members resign.

A larger membership, it was believed, would become too unwieldy to allow proper and efficient functioning of the Chapter activities.

Bacchus & Italy Are Honored by Rhode Islanders

Quartette Line-up Shifts Rapidly Theme Song Is Delousey

By Walter M. Saunders, Jr.

Rhode Island Chapter — Manfredi's Restaurant in Providence was the gathering place for an evening of fun, frolic and food on Jan. 15.

Carl Peterson, genial and efficient secretary-treasurer, evidently of Italian extraction, suggested the consumption of food furnished by his countrymen from the sunny shores of the Mediterranean. The Executive Committee approved wholeheartedly, especially since Pete, until now considered of Scotch descent, agreed to contribute to the financial part of the program.

About 60 members, on hand promptly at 6:30 p.m., were given to understand that a libation to Bacchus was in order, and then proceeded in a triumphal march to the banquet hall, there to partake of a sumptuous repast.

The Rhode Island Quartette, with a starting line-up of Merle Caruthers, pianist and leader, Stuart Woodruff, Al Dorman, Al Furnans, and augmented by Tom Breen from Boston, filled the air with dulcet harmony. Numerous replacements and substitutions in the quartette took place too fast for the names to be recorded, but no matter who sang, the theme song sounded like "It's Delicious, It's Delightful, It's Delousey."

After hours of gorging, the professional entertainment was started. But there is no need to report more completely on the entertainment, other than to refer to back numbers of THE REVIEW, wherever a chapter has staged a party of this sort.

Along about midnight, with a final Fascisti salute, the last steel treater departed, completely at peace with the world, and Italy in particular.

Difficulties of Mo Hi-Speed Are Removed

Developed After War Because Of Tungsten Scarcity

By Adolph O. Schaefer

Philadelphia Chapter ushered in 1937 with a rousing meeting on Friday, Jan. 8. A capacity crowd braved a combination of London fog and spring evening to participate in a meeting devoted to molybdenum high speed steels and a dinner devoted to the mechanization of the U.S. Army.

A. J. Herzig, chief metallurgist of the Climax Molybdenum Co., delivered the address on "New Developments in Molybdenum High Speed Steels."

It was long recognized that either tungsten or molybdenum could be used to obtain the necessary hot hardness in high speed steel. Molybdenum steels, however, did not find favor because of the extreme difficulty of preventing soft surfaces, caused by decarburization, and because of their erratic cutting qualities.

Interest in Mo Steel Revived

Interest in molybdenum high speed steels has revived since the World War. It was realized that the United States has no adequate supply of tungsten, whereas there is ample molybdenum to care for greatly expanded use.

Research on this subject has taken several directions. An old remedy for the faults of molybdenum high speed steel is the coating of the pieces with borax.

Mr. Herzig announced that research has developed the fact that molybdenum steel, with suitable additions of copper and boron, can be handled similarly to the conventional 18-4-1 type. Such steel meets every test of the more usual composition. Furthermore, super high speed steels can be made by the further addition of cobalt.

Army Mechanization Discussed

The large audience recognized the excellence of the talk by prolonged applause and a rising vote of thanks. The discussion that followed wandered into all fields for the use of molybdenum.

The dinner preceding the meeting was addressed by Lt. Col. L. H. Campbell, Jr., on the "Mechanization and Motorization of the United States Army."

An interesting feature of this talk was a series of slides showing the development of tanks since the World War. Lt. Col. Campbell also had unusual data comparing the cost and effectiveness of a motorized brigade to an old-fashioned cavalry unit.

Malleable Expert at Peoria

By T. P. Black, Jr.

Speaker at the meeting on Jan. 11 was Prof. Enrique Touceda of the Malleable Founders Society.

Professor Touceda, who has been a member of committees on cast iron of the American Society for Testing Materials since 1903, presented a very interesting talk on malleable cast iron, illustrated with suitable slides.

The meeting was held at the Caterpillar Tractor Co., with an attendance of 150 for the dinner and 230 for the meeting. L. E. Roby of the Peoria Malleable Castings Co. was the technical chairman.

Public Enemy No. 1 Is Noise Says Vennes

Communication Circuits Need Excellent Contacts

By Gordon Sproule

Montreal Chapter—The first meeting after the holidays, on Jan. 11, was appropriately made a festive occasion designated as "Past Chairmen's Night." Past chairmen, identified by carnations, were guests of the Chapter.

After dinner, P. C. Charles E. Herd made an eloquent plea that all members take heart from the fact that membership is over 200, get busy, and make it at least twice 200.

Next an exhibition of magic by Prof. Charles Peet made Lucas and Bourke-White look like pikers as far as skill with a "camera" is concerned.

The lecture of the evening, on "Some Master Elements in Communication," was given by H. J. Vennes, special products engineer, Northern Electric Co., Ltd., Montreal.

Precious Metals Abate Noise

Public enemy No. 1 in the communication field is noise, due to bad contacts. It is fought, Mr. Vennes pointed out, by means of precious metals, either solid alloys such as "contact metal" consisting of gold, silver and platinum, or a plating of such noble metals.

Whereas power connections are substantial and comparatively permanent, communication circuit contacts are made and remade interminably, by delicate mechanisms; in an average exchange there are a quarter of a million operating contacts.

Most metalmen have heard of "permaloy" (Ni 78%, Fe 22%), of which the magnetic permeability is much better than the purest iron. Improved permaloys, containing 3 to 4% chromium or molybdenum, are now used for cores of loading coils and transformers; a slide showing the relative size of such cores indicated an improvement comparable to that of permaloy over iron.

Eight-Ball Mike Shown

Slides were shown of transmitters, receivers and the "eight-ball mike" (non-directional) with the many metals, alloys and other materials indicated.

Mr. Vennes mentioned as a matter of interest that conductivity copper may be cold drawn without annealing, so that 1 ft. of wire rod produces 10,000 ft. of wire.

He also showed slides of various thermionic valves, or "tubes," including the 100-kw. tube in which the plate (external) is cooled by distilled water, passing through pyrex tubing, to insulate its 18,000-volt potential.

An interesting and truly a master element in communication is the quartz crystal plate, which by virtue of its piezo-electric characteristics, can control radio frequencies with a precision equivalent to a few seconds per year.

Coaxial Cable Developed

A very new and almost startling master element is the coaxial cable. A pair of these cables has just been installed between New York and Philadelphia. They are capable of transmitting carrier currents of a frequency of a million cycles, making possible 240 telephone conversations, or 12 times that many telegraph messages.

The coaxial cable consists of a copper wire centered by disk insulators in a copper tube made of drawn helical elements. This is wrapped with steel tape and insulation. The two cables (and other insulated wires) are enclosed in the usual extruded lead sheath.

After a vote of thanks had been proposed by A. F. Hanly, and warmly accorded, members and guests were invited to renew acquaintanceships and to circulate between a well-supplied beer table and an elaborate exhibit of material and equipment loaned by the Northern Electric Co.

Five Varieties of Copper Produced Named by Wilkins

By F. H. Clark

New York Chapter—Five types of copper are at present produced commercially, according to R. A. Wilkins, vice-president of the Revere Copper and Brass, Inc., speaking at the regular meeting on Jan. 18. They are:

1. Electrolytic.
2. Lake copper, which contains some silver and arsenic.
3. Phosphor deoxidized.
4. Oxygen-free high conductivity.
5. Fire refined.

For an extra charge the usual copper wire bar can be scalped to remove the set surface which contains cuprous oxide, a detrimental constituent. Another method for decreasing the oxygen content is to use an end-poured ingot and to crop the end containing the impurities.

However, the purest and most expensive copper today is the oxygen-free high conductivity.

Dr. Wilkins mentioned one of the newest extrusion processes—the tube reducing machine, which appears to have interesting possibilities for tube manufacture.

The speaker believes that copper-silicon alloys show such promising physical properties that they may eventually be used as much as brass is today. Their corrosion resistance is particularly good.

One of the most important phases of the metallurgy of copper alloys which still needs considerable study is casting practice. Much research could be done on this problem to improve our present methods.

Testing Is Discussed

Templin Describes Equipment, Methods And Numerous Other Phases

By E. S. Davenport

New Jersey Chapter—R. L. Templin, chief engineer of tests for the Aluminum Co. of America, New Kensington, Pa., was the speaker at the meeting on Jan. 11; his subject was "The Use and Interpretation of Physical Testing in the Field of Metals."

Mr. Templin's long and varied experience in the field of mechanical testing led to an excellent lecture. He described various types of standard and special testing equipment, pointing out some of their limitations and calling attention to the all-important matter of technique in their use.

He covered such subjects as design of test specimens, the difference between "reproducibility" and "accuracy," correlation of results of different methods of testing such as tensile, impact, fatigue, etc., mechanical properties of pure metals and alloys, interpretation and graphical representation of test results, and other phases of testing too numerous to mention. He gave us a broad picture of the whole subject with just enough detail to make it interesting and instructive.

The usual lively discussion took place afterward in which the speaker was bombarded with questions concerning specific aspects of his subject.

Anticipations Are Justified When Bain and Eisenman Take Charge of Meeting

By Walter C. Troy

Notre Dame Chapter—When President Bain and Secretary Eisenman are scheduled to take care of a meeting, an expectant attitude on the part of the members is thoroughly justified.

The remarks following Dr. Bain's address and the genuine laughter punctuating Mr. Eisenman's remarks gave undeniable evidence that the meeting on the night of January 15, 1937, was one to remain long in the memory of the Notre Dame Chapter. The members liked it, the guests liked it, and even Mr. Eisenman's anxious sow liked it.

THE REVIEW has previously carried an account of Dr. Bain's lecture, "Some Apparent Anomalies in the Heat Treatment of Steel." Nevertheless, it would not be fitting to omit some remark upon the nature of his presentation.

Although the discussion was technically accurate, the phenomena associated with the heat treatment of steel were considered in their essence with practically all of the specialized technical nomenclature omitted. A rare achievement is this, and a most effective means of verbally presenting a paper.

Course Adds 60 Members

The Boston Chapter educational course is well under way with over 200 registered and better than 60 new members signed up for the A.S.M.

This course comprises three series of lectures. The first, which was just concluded, was J. P. Gill's course on Tool Steels, the second is H. D. Churchill's Physical Testing series, and the third will be the lectures on Principles of Heat Treatment by M. A. Grossmann.

Talk, Movie on Alloy Steels

Metallurgical Developments Abroad Are Also Described by Waterhouse

By Howard E. Handy

Boston Chapter — More than 300 members and guests gathered at Massachusetts Institute of Technology on Friday, Jan. 8, to hear J. K. Killmer, Metallurgical Department, Bethlehem Steel Company.

Mr. Killmer described briefly the effect of alloys in steel, spoke about some of the recently developed alloy steels, and then showed the new Bethlehem motion picture, "The Making of Alloy Steel."

Both the talk and the motion picture were enjoyed by those present.

The usual dinner was held in Walker Memorial at 6:15. Dr. George B. Waterhouse, professor of metallurgy at M.I.T., and vice-president of the A.S.M., gave the coffee talk on his observations in Europe. Dr. Waterhouse spent several weeks last summer in England and on the Continent, and described the developments in metallurgy which he observed in Germany and England. Dr. J. P. Walsted, chairman, presided at dinner.

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HERE AND THERE WITH A.S.M. MEMBERS

KNOWN to members of the American Society for Metals as a past president and as the originator of some extremely fine metallographic methods, ROBERT G. GUTHRIE has now been appointed chairman of the Ferrous Metals Committee of the Industrial Gas Section of the American Gas Association.

Bob is consulting metallurgist for the People's Gas Light and Coke Co., Chicago, and has made many improvements in the application and conservation of heat in metallurgical processes. At present he is also serving on the *Metal Progress* Editorial Board.

* * *

ANOTHER past president, A. E. WHITE, director of engineering research, University of Michigan, is now taking a two-month Mediterranean trip.

* * *

HOWARD AGNEW SMITH, who comes to the metallurgical laboratory of Republic Steel Corp. in Canton, Ohio, has had a short but intensive career in research since his graduation from University of Illinois in 1931 with a Ph.D. in physical chemistry.

After a year as physicist for A. O. Smith Corp., he did some work for United Air Lines on fatigue of aluminum alloy propellers. From 1933 to 1935 he held an International Research Council Fellowship, working at Carnegie Institute of Technology in diffusion and transformation reactions in alloy steels.

Recently he has been investigating pit corrosion in stainless steels for the Chemical Foundation at M.I.T. At Republic he will be in charge of various phases of corrosion and high temperature oxidation of stainless steels.

(Above) *R. G. Guthrie*

(Above) *H. A. Smith*

(Below) *James T. Gow*

(Below) *L. C. Conradi*

BATTELLE Memorial Institute has appointed JAMES T. GOW as research metallurgist. Mr. Gow is a 1929 graduate from the University of Minnesota, to which he owes a master of science and metallurgical engineering degree.

He has been identified with the development of gamma ray inspection of steel castings in the Naval Research Laboratory as advisor in the Navy Yard foundries. Since 1930 he has been with International Nickel Co. in the research laboratory investigating heat and corrosion resistant alloys, a field in which he will continue at Battelle.

LABORATORIES in the Endicott plant of International Business Machines Corp. contain some of the most up-to-date equipment obtainable and have promoted research and development work resulting in increased use of free-machining metals and improvements in methods and equipment in the heat treating, plating, metal finishing, welding, and brazing divisions of the plant. These laboratories were installed and organized by L. C. CONRADI, who came to I.B.M. as metallurgist in 1931 and who is now promoted to the position of technical research director of the Endicott plant. He will have direct supervision of the chemical, metallurgical, paper, and electrical laboratories.

In addition to his well-known activities in the Southern Tier Chapter, A.S.M., Mr. Conradi is also a member of the American Society for Testing Materials, the Society of Automotive Engineers and American Electroplaters' Society.

* * *

RESPONSIBLE for developing nearly 100 very excellent technical meetings, PIERCE T. WETTER now leaves the staff of the American Society of Mechanical Engineers, where he has supervised the technical professional division for ten years. He now becomes executive vice-president of the American Cutting Alloys, Inc., New York.

In his new position Mr. Wetter will have charge of developing the manufacture and sale of cemented carbide titanium tips and cutting tools, particularly for high speed cutting.

He also becomes vice-president and assistant treasurer of the American Electro Metal Corp. of Lewiston, Me.

AFTER two years as open-hearth superintendent of the Railway Steel-Spring Division of the American Locomotive Co., C. F. CHRISTOPHER has now been made chief metallurgist.

Mr. Christopher began his career in 1923 in the inspection department of Jones & Laughlin Steel Corp. and advanced to the metallurgical department and finally to the position of assistant superintendent of one of the open-hearth departments. In 1928 he resigned to team up with the Metallurgical Advisory Board of Carnegie Institute of Technology and the U.S. Bureau of Mines, where he took charge of open-hearth work under C. H. Herty, Jr.

* * *

ANNOUNCEMENT comes from NATHAN LESTER of the opening of a business to be known as Lester Engineering Co. in Cleveland. Mr. Lester has formerly been associated with Superior Die Casting Co.

A new die casting machine designed by the Lester Engineering Co. will be manufactured and sold by the Phoenix Ice Machine Co., also of Cleveland.

* * *

EMPLOYED to do research work on cast iron at the Bayonne research laboratory of the International Nickel Co. is FREDERICK G. SEFING, who is a graduate of Lehigh University and holds a master's degree from Pennsylvania State College.

Mr. Sefing has heretofore been assistant professor of metallurgy at Michigan State College, where he conducted a series of lectures in an educational course sponsored by the Detroit Chapter last winter. He was also at that time a member of the executive committee of the Chapter.

WAYNE L. COCKRELL has been added to the staff of Michigan State College as instructor of mechanical engineering.

* * *

ACTIVE at A.S.M. technical sessions is O. W. MCMULLAN who has recently joined the Indiana Harbor Works of the Youngstown Sheet and Tube Co. at East Chicago, Ind.

For the past year and a half Mr. McMullan has been with the International Nickel Co. in the research laboratory. Prior to that he was chief metallurgist for Timken-Detroit Axle Co.

* * *

WALTER M. SAUNDERS, JR., who reports the doings of the Rhode Island Chapter to THE REVIEW, has been elected president of the New England Foundrymen's Association.

† † †

WILLIAM K. HAWKES, assistant engineer for the Weatherhead Co., Cleveland, was killed on Jan. 25 when his automobile was struck by a train.

Mr. Hawkes, who was a graduate of Rensselaer Polytechnic Institute, was chemical engineer for the Buick plant in Flint and was later employed by the Fuller Transmission Co. in Kalamazoo, Mich. He had been with the Weatherhead Co. since 1932.

† † †

CRANDALL ZACHARIAH ROSECRANS, assistant director and chief of the metallurgical division, Leeds & Northrup Co., Philadelphia, died on Jan. 7.

Mr. Rosecrans received his B.S., M.S. and M.E. in mechanical engineering from University of Illinois and had nearly completed the work for a Ph.D. at the time of his death. He had been with Leeds & Northrup since 1926.

He was the author of many technical papers, his principal research activities having been in connection with fluid flow meters, thermal conductivity gas analysis, combustion control and carburizing furnaces.

Welding Symposium Is Presented By Four Local Men in Baltimore

By Emerson S. Norris

Baltimore Chapter—Four local men provided a symposium on welding for the January meeting. H. N. Boetcher of the Consolidated Gas & Electric Co. acted as chairman and gave an absorbing talk on welding methods.

He dwelt principally on the difference between acetylene and arc welding. The greater heat and lower temperatures of oxy-acetylene over the arc produce a decided difference between structures and physical properties of welds produced by these two methods.

Design of Welds Stressed

Mr. Boetcher laid great stress on intelligent design of welds and selection of rods and methods, as well as logical education of welders. He explained that the welder cannot be blamed for faulty work if the equipment is not correct for the job or the design is poor.

Numerous lantern slides showing weld structures and examples of poor welds exemplified Mr. Boetcher's points.

The second speaker was W. P. Davis of the Baltimore Transit Co., who described a carbon arc welded rail joint developed by his company. Fifteen thousand of these joints have been made with no failures—certainly a fine record. Another feature of this joint is that it can be dismantled and the rails used again.

Ronay Discusses Alloy Welding

B. E. Ronay, U. S. Naval Engineering Experiment Station, Annapolis, Md., then discussed alloy and nonferrous welding.

Citing numerous examples, he explained the necessity of preheating and heat treatment in certain steels. Often the use of a rod producing a weld of the same analysis as the parent metal is imperative, one reason being that the difference in the coefficient of expansion between the weld and parent metal can be great enough to cause severe warping.

Mr. Ronay described acetylene and arc welding of brass and the problems arising from the zinc content and high thermal conductivity of the alloys.

The last speaker was L. J. Gould of the Bethlehem Steel Co., at Sparrows Point, Md. The major use of welding in this plant is for maintenance where the cost per ton is closely watched. It is used in a variety of fashions and often in very unorthodox manners.

Smooth Joints Required on Roofs

Among the numerous examples given by Mr. Gould was the use of welding in building construction. Particularly on roofs, smooth joints are desired to prevent the accumulation of dust which speeds corrosion. The substitution of welding for riveting aids in accomplishing this.

Another interesting application is welding the joints of the steel work around furnaces to provide greater heat transfer.

Officers' Night Gets Crowd

By E. V. Peterson

North West Chapter—National officers night on Jan. 12 brought out the largest crowd of the year, both for the dinner meeting and the subsequent lecture.

Dr. E. C. Bain, national president, and W. H. Eisenman, national secretary, were the featured guests.

The subject of Dr. Bain's lecture was "Anomalies in the Heat Treatment of Steel." The various aspects of hardenability were thoroughly discussed, and the effects of rate of cooling, austenitic grain size and composition were brought out clearly.

Modern Malleable Iron Foundry Shows Striking Contrast to Older Type

By A. J. Dornblatt

Washington Chapter — The fourth meeting on Jan. 11 was featured by Dr. H. A. Schwartz's one-man symposium on "Malleable Iron."

Dr. Schwartz, who is manager of research, National Malleable and Steel Castings Co., Cleveland, impressed this reporter with the remarkably complete manner in which he covered the history and trend of developments in the malleable iron industry, and the metallurgy and metallography of ordinary and special malleable irons.

Modern equipment of the continuous flow type was depicted by lantern slides in striking contrast with the older type foundry. Various examples of furnace equipment used in melting and annealing the iron were shown and discussed.

Malleable Is Versatile

Photomicrographs brought out the unique characteristics of this versatile material and showed the improvement resulting from special treatment and analysis. A classification of various modifications of malleable iron served to emphasize the wide range of useful properties obtainable.

Prior to the regular meeting, the educational section met for the sixth lecture of the educational course being presented by Professors Dornblatt and Coonan, the topic being the alloys of copper and tin. The class was very well attended.

The Washington Chapter, while not the largest, seems to have the record for consistently high proportional attendance at meetings. This is mainly the result of the excellent work of the Program Committee, headed by W. J. Jeffries, although the quality of the refreshments served at the convivial half-hour after the meetings may have some influence.

Free Literature — Mail Coupon Below

● **Insulating Brick**
A new member of the Johns-Manville insulation family has been announced. It is an insulating brick, and data sheets containing particulars on characteristics and recommended uses are available. Bulletin Ba-100.

● **Stress-Strain Recorder**
The many applications of the Baldwin-Southwark stress-strain recorder, its unique advantages, and the many ways it can give unusual service will be extremely interesting to all who have to do with testing methods and equipment. Bulletin Ba-67.

● **Hydraulic Tester**
Of interest to all engineers recommending or purchasing universal testing machines is a book by Riehle Division of American Machine and Metals, Inc., on the development of the precision hydraulic testing machine. Bulletin Ba-157.

● **Magnet Steels**
A very handsome booklet describes the permanent magnet steels and castings made by Simonds Saw & Steel Co., including Alnico and Alnic. Bulletin Ba-158.

● **Electrodes**
Recommended welding procedures for the new "Shield-Arc 100" electrode as well as all other Lincoln electrodes are contained in the latest "Supplies Bulletin" published by Lincoln Electric Co. Bulletin Ba-10.

● **Illuminator**
An illuminator free from glare, for use with standard microscope stands, is described in a leaflet by Pfaltz & Bauer, Inc. It is known as the Reichert Epilum Illuminator. Bulletin Ba-142.

● **Heat Resistance**
Those who have sent for the other bulletins in Republic Steel Corp.'s series on "Republic's Perfected Stainless Steels" will not want to miss the one describing the heat resisting types, HCN, NC-3, and HC. Bulletin Ba-8.

● **Stabilog**
Ten outstanding advantages of the potentiometer Stabilog are fully explained in an attractively laid-out folder by the Foxboro Co. Bulletin Ba-21.

● **Hard Case**
A continuous breakdown test on Holden Hard Case heat treating bath is fully described and the remarkable results explained in a folder by A. F. Holden Co. Bulletin Ba-55.

● **Oil Testing**
An oil testing instrument catalog issued by C. J. Tagliabue Mfg. Co. should be in the hands of every oil chemist as well as all those who are interested in testing machines. An up-to-date price list is included. Bulletin Ba-62.

● **Nickel Steels**
A bulletin on the properties and applications of heat treated wrought nickel alloy steels will act as an invaluable aid in selecting suitable steels to meet modern industrial demands in either products or plant equipment. International Nickel Co., Inc. Bulletin Ba-45.

● **Metal Surfaces**
A manual giving in detail methods for the application of sodium cyanide solutions in the preparation of metal surfaces is announced by the R. & H. Chemicals Department, E. I. du Pont de Nemours & Co. Bulletin Ba-29.

● **Modern Metallograph**
The new Bausch & Lomb research metallographic equipment, which is arousing so much interest and favorable comment in the profession, is the subject of advance literature, recently issued. Bulletin Ba-35.

● **Oxygen Lance**
An eight-page booklet, profusely illustrated with diagrams and pictures, puts into convenient form much valuable information on the oxygen lance, which will be especially useful to anyone working with heavy sections of metal. The Linde Air Products Co. Bulletin Ba-63.

● **Sicromo**
Timken Steel & Tube Co. has issued a new booklet on Sicromo steels which gives analyses of these new steels and discusses the effect of both silicon and chromium on oxidation resistance. Bulletin Ba-71.

● **Ovens**
Maehler recirculating ovens speed baking and reduce fuel costs. Why is told in a well-printed and illustrated booklet by The Paul Maehler Co. Bulletin Ba-159.

● **Metals for Corrosion**
Fourteen varieties of Midvaloy corrosion and heat resisting metals are described in a detailed bulletin by The Midvale Co. Properties and applications are listed and illustrated. Bulletin Ca-160.

Moly Matrix
Climax Molybdenum Co.'s little monthly newspaper contains many interesting and informative articles. Get the latest issue—Bulletin Ax-4.

Heroult Furnace
A complete exposition of the Heroult electric furnace is carried through in logical style in an exceedingly handsome illustrated booklet by American Bridge Co. Salient features, types, sizes and capacities, suggestions for installation, auxiliary equipment and practical advantages are given. Bulletin Jyb-124.

Centricast Boxes
The story of centrifugally cast carburizing and annealing boxes—their reason for being, method of production, properties, and advantages—is made extremely readable in a folder by Michigan Steel Casting Co. Bulletin Jya-84.

Testing Machines
An extremely handsome, spiral-bound, segregated catalog tells all about the various hydraulic and screw power testing machines made by Tinius Olsen Testing Machine Co. Bulletin Oy-147.

Firebrick
Babcock & Wilcox make an insulating firebrick which is refractory as well as insulating and can be used without a facing of firebrick. Description, applications, and engineering data are contained in Bulletin Fy-75.

Aluminum News
A cleverly written, well-illustrated newspaper of interesting items about aluminum is issued by Aluminum Co. of America every month. The latest issue is Bulletin Jyx-54.

Silico-Manganese Steel
Silico-manganese steel for heavy springs is the subject of Bethlehem Steel Co.'s new folder giving its properties and recommendations for heat treatment. Bulletin Jyx-76.

Kanthal
Kanthal, an alloy for electric heat developed in Sweden, is now being marketed in the United States by C. O. Jelliff Mfg. Corp. A new catalog gives full information on properties, forms available and fabrication. Bulletin Oy-78.

Centrifugal Casting
A new circular has been prepared by the Calorizing Co. describing their methods of centrifugal casting. Bulletin Dy-26.

Blast Cleaning
So many changes have taken place in blast cleaning and dust collecting equipment in the past three years that Pangborn Corporation's "quick reference" catalog of condensed information will be invaluable to all those interested in this subject. Bulletin Jyc-68.

Newer Tool Steels
Vulcan Crucible Steel Co. has a complete and attractive catalog listing their full line of tool steels including many special types to meet the modern trends in industry. Bulletin Jyb-127.

Airless Cleaning
Comprehensive coverage of abrasive cleaning and preparation methods by description and illustration is contained in a colorful book published by the American Foundry Equipment Co. It describes the airless abrasive cleaning and preparation method known as "Wheelabrating." Bulletin Dx-112.

Boiler Furnace Brick
The whole story of Crystolon (silicon carbide) brick for heavy duty use in boiler furnace walls or linings is contained, not in a nutshell, but in very compact form in a striking folder by the Norton Co. Bulletin Jyb-88.

Stainless for Processing
Authoritative and complete is U. S. Steel Corp.'s well-made brochure on stainless steels for the process industries. Included in the general metallurgical information contained are a complete table of properties of USS stainless steels and a table of resistances to acids and chemicals. Bulletin Oy-79.

Cleaning Processes
An attractive 12-page booklet entitled "Scientific Metal Cleaning" has been published by Detroit Rex Products Co. It describes in detail the applications and advantages of Detrex degreasing with Perm-A-Clor or Triad Safety Solvents and the applications of Triad Alkali Cleaning Compounds and Strippers. Bulletin Oy-111.

Liquitol
The use of Liquitol for controlled cooling of iron and steel castings and ingots is fully described in a bulletin by Alpha-Lux Co., Inc. Bulletin Mya-120.

Globar Elements
Globar electrical heating units and a variety of accessories for their operation have been catalogued by Globar Division of Carborundum Co. Bulletin Oy-25.

Foundry Metallograph
Today's engineering cast irons are structure-controlled in the foundry. The E. Leitz simplified micro-metallograph MM-2 is particularly adapted to foundry applications. Bulletin Fy-47.

Stainless Data Book
All users of stainless and heat resisting alloys should find invaluable the information contained in a booklet published by Maurath, Inc. giving complete analyses of the alloys produced by the different manufacturers, along with the proper electrodes for welding each of them. Bulletin Jyb-125.

X-Ray Examination
The application of X-ray examination and inspection to castings, welding, and food products, as well as practical X-ray crystal analysis, is completely described and strikingly illustrated in General Electric X-Ray Corp.'s new 34-page publication. Bulletin Dy-6.

Titanium in Steel
The use of ferro-carbon-titanium in steel is thoroughly described in a booklet of Titanium Alloy Mfg. Co. Titanium's application in forgings, castings, rails, sheets and plates is interestingly explained. Bulletin M-90.

Drawing Furnace
A new convected air gas fired furnace for drawing and tempering dense loads has been announced by Despatch Oven Co. Complete details concerning its design and operation, the results obtainable, and prices are given in Bulletin Dy-123.

Stainless Tubing
A folder full of helpful technical data on the properties and use of welded stainless steel tubing, a product finding many new applications, is offered by Carpenter Steel Co. Bulletin Oy-12.

Nickel Silver
Riverside Metal Co. has just published a beautiful booket on nickel silver. If you want the latest information on this subject, presented in an attractive, interesting manner, write for Bulletin Aa-156.

Fine Steels
Compiled by men who make fine steels to assist men who use fine steels, a handy, pocket size, 150-page volume by Ludlum Steel Co. contains many new, helpful charts and tables, all made quickly available by a unique method of indexing. Bulletin Aa-94.

Forging Experience
The experience of 21 years has made National Forge and Ordnance Co. the headquarters for a host of basic electric steel products. Typical products and equipment for making them are described in a series of attractive pictorial circulars. Bulletin Dy-136.

EPI Microscope
The Zeiss EPI microscope for the illumination and observation of opaque material has unlimited applications for observing opaque material in dark field, bright field, and polarized light. A descriptive leaflet is published by Carl Zeiss, Inc. Bulletin Aa-28.

Brinell Tester
Accurate and exact measurements can be made on hard or soft materials with the Diamo-Brinell hardness testing machine, which uses a pyramid-shaped diamond instead of a steel ball. Described in a pamphlet by Pittsburgh Instrument and Machine Co. Bulletin Aa-1.

Tube Furnaces
The uses, construction, control and operation of combustion tube furnaces are given in a folder by Hevi Duty Electric Co. which includes complete specifications for various types. Bulletin Aa-44.

Thermometers
A 72-page catalog by Brown Instrument Co. covers the complete line of Brown thermometers and pressure gages—indicating, recording and controlling—and enumerates the wide range of industries to which they are applicable. Bulletin Aa-3.

Hardening Furnaces
P. D. M. high speed hardening furnaces are described in two bulletins by The Philadelphia Drying Machine Co.—one devoted to oil-fired and one to gas-fired furnaces, both made in single and twin chamber models. Details of construction, design features and tables of sizes and capacities are included. Bulletin Oy-150.

Muffle Gas Furnaces
Two models of Juthe muffle type gas furnaces for pre-heating, hardening and annealing, and for heat treating high speed steel are described in bulletins by American Electric Furnace Co. Bulletin Aa-2.

Coordinated Control
A new system, known as the Coordinated Control System, for automatically operating all of the technical operations and factors of an industrial process is described by the Bristol Co. Bulletin Aa-87.

Liquid Carburizing
E. F. Houghton's Perliton liquid carburizer is the subject of a 23-page booklet. Depth of case, speed of penetration, and other results are well illustrated with graphs and photomicrographs. Bulletin Nv-38.

Heat in Industry
"Wherever Heat Is Used in Industry" is the title of Surface Combustion Corp.'s new booklet which starts with "Surface Combustion" principles and shows a part of various types of standard burners and furnaces and special furnaces. Bulletin Dx-51.

Tempering Furnace
Technical details and operating data on Lindberg Steel Treating Co.'s new Cyclone electric tempering furnace, which has shown a remarkable performance record in steel treating operations, are given in Bulletin Fx-66.

Compressor Data
General information on the application of blowers to gas and oil burners, and miscellaneous applications for other types of work are included in a 12-page "Turbo Compressor Data Book." Useful tables and charts are included. Spencer Turbine Co. Bulletin Dy-70.

Bright Annealing
Electric Furnace Co. tells about their controlled atmosphere furnaces for continuous deoxidize annealing, bright normalizing and annealing ferrous and non-ferrous metals. Work comes clean, bright and dry from these furnaces. Bulletin No-30.

Laboratory Service
A new edition of "The Metal Analyst" tells about an organization established by Adolph I. Buehler specializing in the installation of metallurgical laboratories. The complete line of laboratory equipment marketed by Buehler is also catalogued. Bulletin Dy-135.

Capacitrol
An indicating control pyrometer is made by Wheelco Instruments Co., known as the Wheelco Capacitrol. Their bulletin gives full description, wiring diagrams for different furnace or oven installations, and price. Bulletin Mya-110.

Cutting Oils
The problems of machine tool lubrication engendered by the high speed production and close tolerances of modern industrial operations are discussed and progress in cutting oils during the past few years reviewed in a booklet by D. A. Stuart & Co. Bulletin Jyb-118.

Electric Salt Baths
Literature is available from Bellis Heat Treating Co. describing electrically heated bath furnaces which are economical to operate and have a wide range of applications in hardening, annealing, and heat treatment of high speed steel, stainless steel, nickel, aluminum, copper and bronze, etc. Bulletin Ny-48.

Pure Metals
Pure, carbide-free metals are described and applications suggested in a pamphlet published by Metal & Thermit Corp., who make pure tungsten, chromium and manganese in addition to the ferro-alloys. Bulletin Mya-64.

Electric Heat
The certainty of results obtained with electric heat is economically available in automatically controlled electric furnaces. Hoskins Mfg. Co. has a catalog stressing the advantages and low-cost maintenance of their line of furnaces. Bulletin Jya-24.

Port Valves
Diagrams and descriptive matter show the operation of adjustable port valves made by North American Mfg. Co. that are particularly suitable for mediums whose rate of flow is not constant. Bulletin Oy-138.

Electric Control
A complete new control system for regulating input in proportion to demand is described in "Micromax Electric Control," an illustrated eight-page catalog issued by Leeds & Northrup Co. Bulletin Oy-46.

Alloy Castings
Michiana Products Corp. has published a new book describing Michiana corrosion resistant and stainless steel alloys. Generously illustrated, it suggests many savings for the use of these alloys. Bulletin Oy-81.

Nichrome
"Nichrome" nickel-chromium resistance alloy is not the only product made by Driver-Harris Co. A new 68-page catalog gives complete data for this well-known material as well as a wide variety of other alloys. Bulletin Oy-19.

Ferro-Alloys
An interesting folder by Electro Metallurgical Co. tells all about their ferro-alloys and their special service to users which will help them to operate their furnaces and make alloy additions under the proper conditions. Bulletin Jya-16.

Testing with Monotron
Shore Instrument & Mfg. Co. offers a new bulletin on Monotron hardness testing machines which function quickly and accurately under all conditions of practice. Bulletin Je-33.

Oven Furnaces
In a nutshell American Gas Furnace Co.'s improved oven furnaces offer controlled atmosphere, quiet operation, economy, are over and under-fired and bottom vented. Described more fully in Bulletin Aa-11.

Specialized Tester
The Rockwell superficial hardness tester is a specialized instrument for use where the indentation into the work must be kept shallow or of small area, yet sensitivity preserved. A supplement to Wilson Mechanical Instrument Co.'s catalog on the regular Rockwell tester tells all about it. Bulletin Sy-22.

Heat Treating Manual
A folder of Chicago Flexible Shaft Co. contains conveniently arranged information on heat treating equipment for schools, laboratories and shops, and also illustrates the several types of Stewart industrial furnaces. Bulletin Ar-49.

Recuperators
Results obtained with Carborundum Company's recuperators using Carbofrax tubes are fuel savings, closer temperature control, faster heating, and improved furnace atmosphere. Complete engineering data are given in Bulletin Fx-57.

Corrugated Ingots
The Gathmann Engineering Co. has published a new booklet called "Gathmann Ingot Molds—Their purpose and Design." It illustrates various corrugated ingot contours designed to produce defect-free surface in steel ingots. Bulletin Aya-13.

Nickel-Copper Steels
Exceptional resistance to corrosion and abrasion, increased tensile strength, and higher ductility are the qualities claimed for Youngstown Sheet & Tube Co.'s new series of Yoloy steels. A summary of properties and notes on their characteristics are contained in Bulletin Ox-93.

Heat Resisting Alloys
Authoritative information on alloy castings, especially the chromium-nickel and straight chromium alloys manufactured by General Alloys Co. to resist corrosion and high temperatures, is contained in Bulletin D-17.

Ni-Cr Castings
Compositions, properties, and uses of the high nickel-chromium castings made by The Electro Alloys Co. for heat, corrosion and abrasion resistance are concisely stated in a handy illustrated booklet. Bulletin Fx-32.

The Review
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Spring Design Expounded in Montreal Talk

'Good Old Carbon Steel' Is Still Most Important Material Says Ray W. Cook

By Gordon Sproule

Montreal Chapter's third meeting was held at the Windsor Hotel, Dec. 7. The lecture, entitled "Springs—Their Design, Materials and Heat Treatment," and delivered by Ray W. Cook, vice-president and factory manager of Wallace Barnes Co., Bristol, Conn., will long be remembered by all who heard it.

Under the heading of "Design," Mr. Cook distinguished clearly between coefficient of elasticity (Young's Modulus) and elastic limit.

The load-carrying capacity of a spring for a given deflection (amount of motion) depends on the shape and amount of metal in the spring, and on the Young's modulus of the metal. Young's modulus for steel (30,000,000 psi. in tension, 12,000,000 psi. in torsion) is practically the same whether the steel is low or high carbon, annealed or hard temper. Varying the temper of the steel does not affect the stiffness, but a steel spring is stiffer than a similar brass spring.

Load Depends on Elastic Limit

The total load carried by a given spring, without permanent set, depends on the elastic limit of the metal, but there is an optimum value for this, beyond which the metal is brittle. Clock springs, when fully wound, may be stressed at 250,000 to 300,000 psi., and small watch springs, in which efficiency and compactness are necessary, may reach 375,000 psi. On the other hand, in aero-engine valve springs, on which lives depend, the stress may be only 65,000 psi.

The importance of quality of material was forcibly brought out; it does not take much of a defect to spoil a watch spring a few mils thick, or a flat spring stressed across the "fiber."

"Good old carbon steel" is still by far the most important material because it gives the results and it is amenable to high production continuous processes. For a maximum combination of efficiency and reliability, however, chromium-vanadium steel is used, as in valve springs. No silico-manganese steel is used in small springs.

Beryllium Bronze Has Possibilities

Hard-drawn 18-8 stainless steel is used where necessary, but its elastic limit is low and uncertain. Hard-finished phosphor-bronze is a well-known material, used where corrosion resistance is needed, and the new beryllium-bronze offers possibilities on account of its high elastic limit.

Equally important are methods of heat treatment. Flat spring stock is cold rolled and process annealed to give spheroidized carbides; in this condition the steel rolls more easily and more uniformly. Strips may pass through the rolls at 1000 ft. per min., the mill being equipped with automatic gaging and screw-down mechanisms. Wire stock is cold drawn and patent-annealed to sorbitic condition between draws.

The very great importance of undecarburized surface requires that heat treating be done in a special gas free from water vapor and sulphur.

After the lecture a sound film was projected, showing and explaining the processes of spring making at the Wallace Barnes plant; much of the equipment is specially designed.

Hamaker Presents Distinctly Different Talk at Cleveland

By Hugh E. Brown

Cleveland Chapter—Sustaining Members' night was Jan. 4 for the Cleveland Chapter and as is the custom the representatives of the sustaining members were invited to sit at the speakers' table and were guests of the Chapter for dinner.

The Cleveland Chapter now boasts 42 sustaining members, and representatives from most of these were present for the meeting.

L. S. Hamaker, vice-president and general manager of Berger Manufacturing Co., Canton, Ohio, was the speaker of the evening. He talked on "Relationship Between the Metallurgist and the Sales Department."

Mr. Hamaker presented some new ideas to the group in a talk that was distinctly different from the usual address. He brought out the fact that the combination of the sales department and metallurgical effort was hard to beat, and showed how each needs the other in developing new ideas and presenting them to the field.

A market analysis made by the sales department, if properly done, will prevent a firm from making a new article or developing a new line of business which would not prove profitable.

Mr. Hamaker illustrated his talk by concrete examples of just what occurs when there is not proper coordination of the metallurgical and sales departments.

Radio City's Distractions Don't Dampen Metalmen's Enthusiasm for Damping

Commuters Struggle With Time Table and Interest in Questions

By J. S. Marsh

New York Chapter—Despite the distractions of Radio City's new ice-rink (which has replaced the out-door café) and duck shooting by light beam and photoelectric cell, a large audience turned an attentive ear on Dec. 21 to G. R. Brophy, now of the International Nickel Co., who discussed the increasingly important property of "Damping Capacity."

Since most of Mr. Brophy's discussion appears in his paper in the December issue of *Transactions*, it will not be reviewed here. Technical chairman, discussion leader, and line backer-upper was M.I.T.'s inimitable A. V. deForest, who had been lured away from Cambridge for the evening.

Before the meeting certain individuals of $p_H = 1$ to 2 made definitely subversive remarks, but even they were forced to confess bad judgment when discussion and questions from the floor extended to an hour that made the commuters pitiful to behold in their struggle between interest in damping and the time table. All ended well, however, because the speaker himself had a little Jersey Central trouble.

An additional event, which aroused considerable interest, was a miniature draw-bench demonstration put on by Mr. Dods of the Summerill Tubing Co. Seamless tubing actually came out of the thing, which was a complete small edition in every way.

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Plastics Made In Steel Molds

Manufacture of Phenol, Urea, And Cellulose Acetate Types Described

By Richard R. Kennedy

Dayton and Columbus Chapters—Molded plastics was the subject of the January meeting, addressed by Edward F. Bachner, general manager of the Chicago Molded Products Corp.

The phenol-formaldehyde type is the most widely used of the various molding materials. It is supplied with such fillers as wood flour, asbestos, graphite, paper or rag stock.

The urea-formaldehyde materials have a filler of sulphite pulp and are used chiefly for their wide range of color. The phenol and urea materials are both thermo-setting. The celulose acetate materials use no fillers, are thermo-plastic, and can be had in a wide range of color.

The conventional molding method of all these materials is substantially the same.

Methods of Molding

Briefly—the molding material in dry powder form is placed in a steel mold and subjected to heat and pressure. This causes the material to flux and take shape in the mold, after which it is allowed to cool and is then removed from the mold.

In the injection type of molding the material is heated to a plastic state outside of the mold and then forced into the mold under pressure similar to the die casting process.

The mold, consisting of a plunger or force, conforming to the inside, and a cavity, conforming to the outside contour of the part to be molded, is usually machined and then ground and polished to a mirrorlike finish.

Hobbing Process on Molds

In the case of a multiple cavity mold, the cavities are sometimes produced by the hobbing process. A punch or hob which corresponds exactly with the bottom and sides of the part to be molded is machined from chrome-tungsten tool steel.

This hob is heat treated and drawn to a Rockwell hardness of C-58, then ground and polished.

It is then forced into a block of low carbon steel to form the mold cavity. Such sinkings are usually made in one operation, though when deep cavities are required, it is necessary to normalize the carbon steel block several times during the process.

After the hobbing process is completed, the cavity block is carburized, hardened and polished.

The plungers, corresponding with the contour of the upper part of the piece to be molded, are machined from non-deforming tool steel and then heat treated to a hardness of C-55.

While the cost of a mold is comparatively high, its life is almost unlimited and the cost of parts produced from it is extremely low.

A motion picture shown in connection with the talk illustrated the method of making material and of molding it.

Stretcher Strains Are Clarified by Testing Machine

Specially Designed, It Aids in Study of Yield Point

By Howard E. De Haven

Detroit Chapter—The ferrous section, at its first meeting of the new year on Jan. 11, listened to a paper on "The Deep Drawing of Sheet and Strip Steel" by Joseph Winlock, chief metallurgist, Edward G. Budd Mfg. Co., Philadelphia.

The speaker described the material used, and the manufacture and annealing of sheets for deep drawing into automobile bodies and fenders.

The subject of stretcher strains was given particular attention. Stretcher strains appear on the surface of the steel after deep drawing as irregular lines of depressions or elevations, and occur as a result of the uneven flow of the metal at the yield point.

A specially designed testing machine records load-deformation curves with different rates of deformation, and thus aids in the study of the yield point phenomena. The results of these tests have been used to explain the action in preventing stretcher strains on sheets which are slightly cold worked or roller leveled just prior to deep drawing.

The grain size most suitable for deep drawing is about 80 grains per sq. in. at 100 diameters.

The speaker pointed out the wide variation in the properties of sheet metal. Dies should be made to accommodate commercial variations, since each die has a certain margin of safety which may be sufficient for successful drawing of one lot of steel but not enough for another lot.

HEAT TREATMENT
and Metallography of Steel

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Bronze Foundry Problems Elucidated For Ontario Chapter by Harold Roast

Simple and Obvious Things May Furnish Solution to Problems That Often Appear Difficult

By J. W. McBean

Ontario Chapter—Since the subject of the January meeting was "Problems in Bronze," it was held jointly with the newly formed Canadian Section of the American Foundrymen's Association.

After the dinner the meeting was turned over to Major Anthes, chairman of the Canadian Section, A.F.A. He introduced the speaker, Harold J. Roast, vice-president of the Canadian Bronze Co., Ltd., Montreal, in the most glowing terms.

In a very lucid talk Mr. Roast showed how some of the simplest and most obvious things are often neglected though they may furnish the solution to problems that appear difficult.

In illustrating the difficulties which result from shrinkage, a large bearing sleeve with a thick ball seat at the center and much thinner ends was shown. When poured on end with the metal running in at the bottom and not properly fed, it had bad shrinkage cracks near the point where the thick and thin sections joined.

By pouring on its side, running the metal in at the parting line, and using a heavy riser above the thick section, the riser fed metal into the last part to solidify and the trouble disappeared.

Covered Risers Recommended

This required a riser of about the same weight as the casting itself. The shrinkage in the riser produced a long pipe in it but the metal in the casting was quite sound.

In large castings of this sort Mr. Roast recommended the use of covered risers. With some of the high shrinkage alloys, such as silicon and manganese bronzes, a special form of gate should be used.

One of the illustrations showed how a slight change in sprue and runner could correct trouble from shrinkage. A large sprue had a basin at the bottom lower than the casting and the runner took the metal to the bottom of the casting. Thus, the basin pulls the metal from the casting, the latter acting as a riser or head feeding to the basin. By omitting the basin, using a smaller sprue, and putting a hump above the runner, this trouble disappears.

In resisting acid attack, especially in the pulp and paper industry, not only is the composition of the metal important but its structure also, since the crystal size affects the selective corrosion.

Gating and feeding and pouring temperatures are all important in securing the desired structure. A fixed pouring temperature, however, cannot be used, since the temperature of the metal in the casting itself is the important thing and this will vary according to dimensions.

To get a fine-grained structure, the pouring temperature should be as low as can be used and still feed completely.

The speaker also urged the need of complete cooperation between the designing engineer, the pattern maker and the foundry.

Cold Rolling of Metals Covered in 2 Lectures Of Educational Course

By D. R. Howerton

The two lectures of the Chicago Chapter's educational course dealing with the cold rolling of metals were completed Jan. 7, at which time J. E. Angle, assistant general superintendent of sheet mills, Carnegie-Illinois Steel Corp., lectured on "Cold Rolling and Drawing Qualities of Steel."

In his readily understandable manner, Mr. Angle thoroughly explained the entire operation of hot and cold strip production beginning with the slab and following it through the rolling, pickling, annealing and tinning operations to the finished product, ready for commercial application.

In the first of this series devoted to cold rolling, E. S. Strang, metallurgical engineer, Western Electric Co., lectured on "Cold Rolling and Drawing of Non-Ferrous Metals and Alloys."

Mr. Strang's extensive experience in the cold rolling of brasses, bronzes and nickel-silvers was reflected in the clearness and conciseness with which he presented this most interesting lecture.

"The Inspection and Testing of Metals" was the subject of the seventh lecture of the course presented Jan. 21. Speaker was Harry B. Knowlton, metallurgical engineer, International Harvester Co.

The methods of inspection and testing as performed and practiced by the leading steel consumers on the principal types of steel formed the theme of the lecture.

CLASSIFIED INDEX

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CHAPTER CALENDA

DATE	CHAPTER	PLACE	SPEAKER	SUBJEC
Feb. 16	Saginaw Valley	Durant Hotel, Flint, Mich.	O. N. Peterson	Metallurgical Contro of Automotive Ste
Feb. 18	Chicago	People's Gas Bldg.	H. F. Moore	Fatigue of Me
Feb. 18	New Haven	Hammond Laboratory, Yale University		Discussion Meet
Feb. 19	Boston			, Pr
Feb. 19	St. Louis	York Hotel	V. N. Krivobok	Workability of Stainless Ste
Feb. 23	Milwaukee	Elizabethan Room, Milwaukee Athletic Club	E. W. Page	X-Rays and Radiogra
Feb. 26	Philadelphia	Engineers Club	N. L. Mochel	Physical Test
Mar. 1	Cleveland	Cleveland Club	D. K. Crampton	Non-Ferrous Developme
Mar. 1	Mahoning Valley	Tod Hotel, Youngstown	J. P. Gill	High Speed St
Mar. 1	Montreal	Windsor Hotel	Sam Tour	Die Cast
Mar. 3	Rhode Island	Providence Engineering Society	P. M. McKenna	Cemented Carbi
Mar. 4	Chicago	People's Gas Bldg.	E. F. Davis	Metallurgical and Heat Treating Furna
Mar. 4	Worcester	Worcester Polytechnic Institute	Mr. Esua	Quenching of St
Mar. 5	Boston	M.I.T. Room 5-330	P. M. McKenna	Cemented Carbi
Mar. 5	Lehigh Valley	Hotel Traylor, Allentown, Pa.		Annual Dinner Meet
Mar. 5	Ontario	Royal Connaught Hotel, Hamilton	O. W. Boston	Machinability of Me
Mar. 8	Baltimore	Engineers Club		Tool St
Mar. 8	Detroit	Hotel Fort Shelby	J. A. Dow R. J. Cowan	Atmosphere Con Atmosphere Con
Mar. 8	New Jersey	Essex House, Newark	C. H. Bierbaum	Bearing Me
Mar. 8	Peoria		T. B. Bechtel	Fuels and Furna
Mar. 8	Rochester	Room 208, Engineering Bldg., University of Rochester	T. L. Taylor	Working Characteristics of Cold Drawn Br
Mar. 8	Washington	Garden House, Dodge Hotel	N. P. Goss	X-Rays in Steel Treat
Mar. 9	Columbus		H. J. French	Hardening Phenome
Mar. 9	Hartford	Hartford Gas Co.	J. A. Gann	New Developments in Magnes
Mar. 9	North West	Minnesota Union, University of Minn.	J. F. Lincoln	Electric Weldi
Mar. 9	Syracuse	Onondaga Hotel	T. H. Nelson	Comparison Between Weldi Melter and Heat Treat
Mar. 9	Tri-City	Rock Island Arsenal	D. A. Campbell	Gas Furna
Mar. 10	Dayton	Engineers Club	H. J. French	Hardening Phenome
Mar. 10	Penn State	Min. Ind. Bldg., Penn State College, State College, Pa.	T. Holland Nelson	Stainless Steels; ot Iron Through the Ag
Mar. 10	York	York	A. M. Candy	Arc Weldi
Mar. 11	Buffalo	Hotel Buffalo	N. F. Tisdale	Molybde
Mar. 11	Cincinnati	Alms Hotel	H. J. French	Hardening Phenome
Mar. 11	Los Angeles		H. Gamel	Non-Ferrous Met
Mar. 11	Pittsburgh	Roosevelt Hotel	S. L. Hoyt	Gases in St
Mar. 12	Chicago	Medinah Club	L. F. Reinartz	Open Hearth Proc
Mar. 15	New York	Third Floor, International Bldg., Rockefeller Center	E. E. Thum	Low Alloy St
Mar. 16	Saginaw Valley	Bancroft Hotel, Saginaw, Mich.	E. R. Darby	Bearing Me
Mar. 16	Schenectady			
Mar. 18	Canton-Mass.	Hotel Onesto, Canton, Ohio	H. Gordon Hayes	Prevention of Depressi
Mar. 18	New Haven	Elton Hotel, Waterbury, Conn.	F. B. Foley	Methods of Treat
Mar. 18	Notre Dame	Engineering Bldg., Notre Dame University	H. W. Zieler	Optics in Metallur
Mar. 22	Southern Tier	Jenkins Inn, Waverly, N. Y.	J. R. Freeman, Jr.	Copper and Copper Allo
Mar. 25	Milwaukee	Milwaukee Athletic Club	E. J. Janitzky	Steel Metallur
Mar. 26	Philadelphia	Engineers Club	James T. Kemp	Brasses and Bron
Mar. ?	Muncie	Anderson, Ind.	Mr. Beck	Machinabil
Apr. 2	Boston	Chamber of Commerce	G. B. Waterhouse	Sustaining Members' Nig
Apr. 2	Lehigh Valley	Hotel Traylor, Allentown, Pa.	H. C. Mann	Testi
Apr. 2	Ontario	Royal York Hotel, Toronto	Dr. H. W. Gillett	The Use of Molybden in Ferrous Metallur
Apr. 5	Cleveland	Cleveland Club	H. C. Mann	Impact Testi
Apr. 5	Mahoning Valley	Tod Hotel, Youngstown	Zay Jeffries	
Apr. 5	Montreal	Windsor Hotel	E. C. Bain	Anomalies in the He Treatment of St
Apr. 7	Dayton		A. W. F. Green	Saga of Fine Stee
Apr. 7	Rhode Island	Providence Engineering Society		Refractor
Apr. 7	York	Harrisburg, Pa.	C. H. Herty, Jr.	Alloy Steels in the Open Hear
Apr. 8	Buffalo	Hotel Buffalo	F. B. Foley	Steel Meta
Apr. 8	Chicago	Medinah Club	W. H. Oldacre	Machinability and Cutting O
Apr. 8	Cincinnati			
Apr. 8	Los Angeles		J. H. Spade and A. Maradudin	Stress Analy
Apr. 8	Pittsburgh	Roosevelt Hotel	G. E. Doan	Invisible Ra
Apr. 12	Baltimore	Engineers Club	Dr. R. A. Wilkins	Non-Ferrous Allo
Apr. 12	Detroit	Hotel Fort Shelby	H. W. McQuaid	Grain Size, Normal and Hardenabi
Apr. 12	New Jersey	Essex House, Newark	C. G. Fink	Corros
Apr. 12	Peoria		H. P. Croft	Forging Brass and Bron
Apr. 12	Rochester	Room 208, Engineering Bldg., University of Rochester	M. A. Grossmann	Alloying Elemen
Apr. 12	Washington	Garden Room, Dodge Hotel	K. R. Van Horn	and Grain Si Radiography a X-Ray Analy
Apr. 13	Hartford		Carl Hewitt and L. A. Lanning	Carburizing Sympos
Apr. 13	North West	Minnesota Union	H. W. Butterbaugh	Copper and Copper Allo
Apr. 13	Tri-City	Rock Island Arsenal	E. C. Bain	Anomalies in Hardena
Apr. 14	Syracuse			Joint Meeting with Southern Ti
Apr. 15	Canton-Mass.	Hotel Onesto, Canton, Ohio	H. W. Gillett	Furnace Atmosp
Apr. 15	New Haven	Hammond Laboratory, Yale University	G. J. Comstock	Powder Metallur
Apr. 16	St. Louis	Granite City, Ill.	Plant Inspection of The Granite City Steel C	
Apr.	Columbus			
Apr.	Milwaukee	Milwaukee Athletic Club	A. B. Kinzel	
Apr.	Muncie	New Castle, Ind.	E. G. DeCoriolis	Radiant Tube Furn
Apr.	Penn State	Min. Ind. Bldg., Penn State College, State College, Pa.	C. H. Herty, Jr.	Grain Size in Ste
Apr.	Worcester			Physical Test